

Review 14 Methods of Integration

Know Basic Formulas (memorized flashcard fast)

1. u-sub

guidelines u = inside of composite
or u = denominator

Is one part the derivative of another part?

yes

du

u =

don't forget to unsubsstitute

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2. parts $\int u dv = uv - \int v du$

used to integrate a product

u = L I P E T
o n o x r
g v l p i
T Y P g
r i g

$\int x^2 e^x dx$
Tabular $\int x^2 \sin x$
dy dx
- / - / -
- / - / -

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3. Partial Fractions

$$\int \frac{\sim}{x} dx = \int \frac{A}{(\quad)} + \frac{B}{(\quad)} dx$$

linear factors $\sim = A(\quad) + B(\quad)$

ex 1 $\int \frac{x}{x^2-4} dx = \int \frac{x}{u} \frac{du}{2x}$

$u = x^2 - 4$ $= \frac{1}{2} \int \frac{1}{u} du$

$du = 2x dx$

$\frac{du}{2x} = dx$

$= \frac{1}{2} \ln|u| + C$

$= \frac{1}{2} \ln|x^2-4| + C$

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$$\text{Ex 2} \quad \int x^2 \ln x \, dx$$

$$u = \ln x \quad dv = x^2 \, dx$$

$$du = \frac{1}{x} \, dx \quad v = \frac{x^3}{3}$$

$$\frac{x^3}{3} \ln x - \int \frac{x^3}{3} \frac{1}{x} \, dx$$

$$\frac{x^3}{3} \ln x - \frac{1}{3} \int x^2 \, dx = \frac{x^3}{3} \ln x - \frac{1}{3} \frac{x^3}{3} + c$$

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$$\int \frac{1}{x^2-4} \, dx = \int \frac{1}{(x+2)(x-2)} \, dx = \int \frac{A}{x+2} + \frac{B}{x-2} \, dx$$

$$1 = A(x+2) + B(x-2)$$

$$x = -2 \quad 1 = -4B \quad B = -\frac{1}{4}$$

$$x = 2 \quad 1 = 4A \quad A = \frac{1}{4}$$

$$\frac{1}{4} \int \frac{1}{x+2} \, dx - \frac{1}{4} \int \frac{1}{x-2} \, dx$$

$$\frac{1}{4} \ln|x+2| - \frac{1}{4} \ln|x-2| + c$$

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$$\int \frac{e^x}{e^{2x}+1} \, dx = \int \frac{e^x}{(e^x)^2+1} \, dx = \int \frac{du}{u^2+1}$$

$$u = e^x \quad \tan^{-1} u + c$$

$$du = e^x \, dx \quad \tan^{-1} e^x + c$$

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